

Improving the reaction capacity of EGB students in the eighth year

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Abstract: The training of physical abilities allows coordinative abilities such as balance, agility, coordination and reaction capacity together with other physical abilities to be considered as the basis for a person to develop locomotion activities optimally, in special for adolescents to carry out exercises for the development of their capacities as biopsychosocial being, the central objective of the research was oriented in the elaboration of an exercise program for the improvement of the reaction capacity in the students of eighth year of general education basic, for this I apply an explanatory level methodology, of a quantitative, quasi-experimental retrospective longitudinal nature, since the 2019 - 2020 school year was analyzed, due to the fact that evaluations were carried out on the sample through the application of the initial test and In the end, empirical, theoretical, analytical research methods were used. lysis, synthesis, induction and deduction to arrive at the answer to the question: What is the incidence of the exercise program to improve the reaction capacity in the eighth year students of higher basic education of the San Camilo educational unit? concluding that, according to the records of the times in the execution of the test, both initial and final, it was evidenced that the plyometric exercises developed in the proposed exercise program served to improve the reaction capacity of the eighth-year students. EGB of the educational unit San Camilo.

Keywords: Physical Capacities, Reaction Capacity, Exercise Program, Plyometric Training

1. Introduction

Physical abilities such as endurance, strength, speed and flexibility, as well as coordination skills including balance, coordination and reaction are considered together as the basis for a person especially for adolescents because these are part of the development of their abilities as a biopsychosocial being. According to (Awuapara-Flores, 2018) adolescence (10 to 20 years) comprises a large number of body modifications. There is rapid growth, changes in body proportions and shapes, to which is added sexual development and maturity.

In addition, indisputably information and communication technology (ICT) has generated great social and cultural changes to which children, young people and adults have adapted, modifying their performance in school, social and family environments.

This problem has global significance, according to (Díaz-Vicario et al., 2019) Previous studies have identified the possible consequences that derive from a problematic use of ICT: loss of time for other activities, behavioral alterations, alterations in mood, changes in sleep rhythms, loss of control, isolation, impoverishment of social relationships, decreased academic performance, family conflicts, [poor physical performance caused by not doing physical activity].

This last point has harmful significance for health, for the World Health Organization (WHO) could avoid up to 5 million deaths a year with a higher level of physical activity of the

world population, also, people with an insufficient level of physical activity have a risk of death between 20% and 30% higher compared to people who reach a sufficient level of physical activity. (WHO, 2021, p. 1)

The lack of physical activity and therefore the lack of exercise, sports or recreational activities on a regular basis has resulted in Latin American countries being considered one of the regions of the world with the highest percentage of the population with insufficient physical activity to stay healthy. (Moreno, 2018, p. 1)

In Ecuador, according to (Rodríguez, 2012) the population of young people between 10 and 18 years old for both sexes will be 2,739,894 and according to (Llerena, 2015) physical inactivity affects more than a third of young people who fall into the category of inactive and only 28% of this age group is considered active. (p. 87)

To alleviate this, the Ecuadorian State through the Ministry of Education made an increase in hours in physical education, going from 2 hours to 5 hours a week from first to tenth of Basic General Education that includes the ages of between 5 to 15 years. (Vanegas, 2015, p. 4)

Likewise, in order to promote the increase in the number of athletes in the ages of 12 to 18 years to compete in the Minor, Pre-Youth and Youth categories in the national sports games organized by the Ministry of Sport, the (Fundamental Charter of the National Sports Games, 2018) was published in which the consecutive execution of the national sports games in the minor category for the years is indicated. 2018, 2019, 2020 and 2021.

The Province of Los Ríos has participated in the national sports games of the minor category (12 – 14 years) had decent and respectable locations between the fifth and ninth place of the total of 24 provinces that make up Ecuador; athletics is one of the most representative sports disciplines that this province has. (Sports Administration System, 2021)

This allows the Provincial Sports Federations to carry out their selection processes and for this they rely on the cantonal leagues and these in turn in the educational area through the Student Sports Federations who keep a record of the athletes who have participated in intercollegiate games.

This is where the physical education teacher plays a preponderant role in the selection and preparation of the students who will represent the educational institution. For this, block four of the physical education curriculum for the period 2019 - 2020 called sports practices was taken into account.

In order to carry out a general preparation in the physical aspect of the students and especially of those who participated in the disciplines of athletics sport that is part of the events scheduled for the intercollegiate games organized by the Student Sports Federation of the Province of Los Ríos, an exercise program was implemented to improve the reaction capacity in the students of the eighth year of higher basic education of the San Camilo Educational Unit.

Likewise, through the application of the program it is intended to reach the answer to the research question which is formulated as follows: What is the incidence of the exercise program to improve the reaction capacity in the students of the eighth year of higher basic education of the San Camilo educational unit?

Development

The ability to react consists of quickly inducing and executing brief motor actions, appropriate to a stimulus, is directly related to sports events especially those that have short-lived motor stimuli, according to (Casillas, 2011) is defined as the voluntary motor response of a person to any external stimulus (acoustic, visual or sound), with prior discrimination of these and in the shortest possible time.

The ability to react is part of the coordinative capacities that every human being has, according to Gomeñuka (2008) this depends predominantly on the process of movement control (information) conditioning by the performance of the athlete; therefore it becomes indispensable to a greater or lesser degree, for the execution of sports activities that are perfected with training.

Directly the ability to react conditions the sports performance of a person inconjunction with other qualities and are expressed by the level of speed and quality of learning, improvement, stabilization and application of technical sports skills.

Taking into consideration what was proposed by Cardona (2018) who mentioned that the sensitive phases should be considered for the training of the capacities since this is defined as the period of time in which the functional, physiological and psychological morph factors are ideal for the development of a quality or a capacity.

Below is an illustration of the sensitive phases:

FASES SENSIBLES DE LAS CAPACIDADES COORDINATIVAS								
CAPACIDAD COORDINATIVA	EDAD	4 - 6 Años	6 - 8 Años	8 - 10 Años	10 - 12 Años	12 - 14 Años	14 - 16 Años	16 +
<i>Básica</i>	Capacidad de aprendizaje motor	3	3	3				
		3	3	3				
		3	3	3				
<i>ESPECIAL</i>	Capacidad de diferenciación y control			2	3	3		
		1	1	2	3	3		
	Capacidad de reacción a estímulos acústicos y ópticos			3	3			
		2	2	3	3			
	Capacidad de orientación en el espacio				3			
		2	2	2	3			
Capacidad de ritmo				3				
	2	2	3					
Capacidad de equilibrio			3	3				
	2	3	3					
<i>Compleja</i>	Agilidad				3	3	3	
				2	3	3	3	
			1	2	3	3	3	

NIVELES	CONVENCIONES
1	Baja intensidad / Aspectos elementales
2	Aumento progresivo de la carga aprovechando el inicio de las fases sensibles.
2	
3	Énfasis en el entrenamiento aprovechando la fase sensible.
3	
3	
→	Se continua entrenando para incremento o conservacion

Figure 1. - Sensitive phases of adapted coordinative capacities of Martin, D., and Nikolaus, J. (2004).

When referring to sensitive phases, it refers to the particular time space where a person's organism is able to respond to motor stimuli optimally, reaching levels of development that influence different capacities, whether coordinative or conditional.

In the particular case of the ability to react by these within the special stage it is considered appropriate to train them with great emphasis on the age of 10 – 12 years, however, esof criteria of the authors that physical exercises should be performed during all stages of life and preferably, start at an early age.

Exercise programmed for the improvement of reaction capacity

Knowing that an exercise program contains a series of exercises that a person has to perform over a period of several weeks, to progressively improve their physical condition, their health and their hope and quality of life, reducing the risk of having an accident while practicing physical exercise.

And agree with what was mentioned by Peinado et al. (2017)sports performance and physical abilities [including responsiveness] can be improved through explosive strength and reaction speed training.

She took into consideration the application of plyometric exercises, this type of exercises are aimed at the development of explosive strength, because the technical gesture in the execution of the same enables the muscles to reach a maximum strength in a very short period of time.

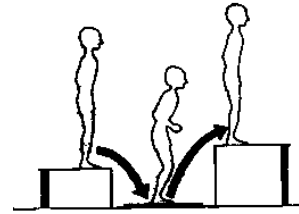
According to Yugcha (2010) plyometric exercises produce the following changes:

At the neural and muscular level, they facilitate the performance of faster and more powerful movement gestures; Improves the mechanical efficiency of the muscles involved in the action; It allows to reduce the coupling times between the eccentric and concentric phases; Improves tolerance to higher stretch loads. (p.16)

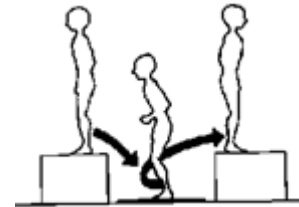
Taking this into consideration, plyometric exercises such as multishopping on boxes with maximum leg flexion, Drops Jumps mentioned by Lorenzo and Luna (2002, p. 6) as well as exercises and methodological considerations proposed by Esper (2000) were executed for the period of 3 months. to which adaptations were made prior to the application carried out in the study population. Table 1 is presented below, which contains exercises that are part of the proposed exercise program:

Order	Description of activities	Illustration
1	Deep jump from point A making a half turn to reach point B by making a vertical jump from the same back or back position.	

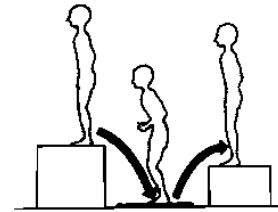
2 Deep jump from a point to different heights in front.



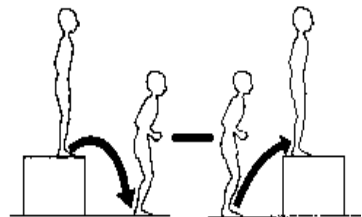
3 Deep jump from point A making a full 180° turn to reach point B by making a vertical jump from the same front or previous position



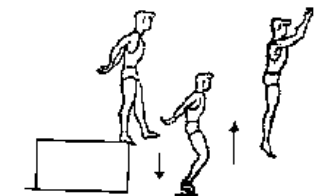
4 Jump in depth from point A to point B, at different heights on your back.



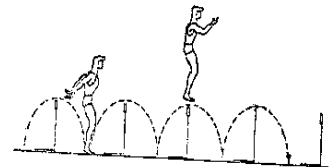
5 Deep jump from point A (brief concentration of force in the legs) Vertical jump to point B with a plinth with weight taking.



6 Deep jump from point A with feet together from a height of between 40 to 60 cm. Once it touches the ground immediately it should be jumped again. what is intended to be done is to avoid in contact with the ground, as much as possible the angle that bends the knees.



7 Jump with your feet together jump between obstacles, separated by 90 centimeters. The height of the obstacles must be such that the athlete does not need to bend his legs (10 obstacles with 6 or 7 repetitions).



8 Locate yourself at a point A in height, proceed to take a step, then with your feet together jump to the front making a jump as far as possible



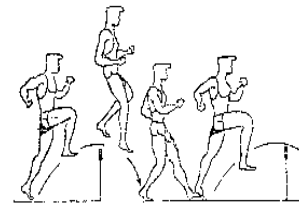
9 Locate yourself at a point A in height, proceed to take a step, then perform the jump with the left foot to the front making a jump as far as possible



- 10** Locate yourself at a point A in height, proceed to take a step, then perform the jump with the right foot to the front making a jump as far as possible



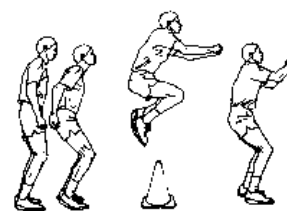
- 11** Perform reaction exercises by locating mini fences perform the jump alternating the jump foot



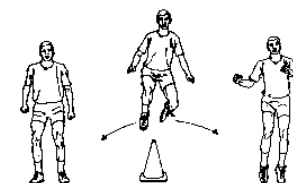
- 12** Jump with both feet; using only the ankles to give momentum, the jumps should be performed by jumping continuously over the same site. Extending the ankles to the maximum in each vertical jump.



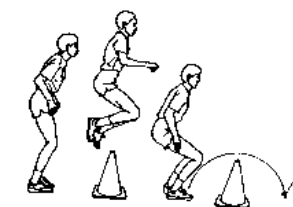
- 13** With the support of a cone as a reference, perform jumps with the feet together without impulse, flexing only the hips, bring the knees up to jump over a cone and pass the obstacle. Do not divert the knees to the sides, or separate them to avoid touching the cone; the body must remain in a straight line.



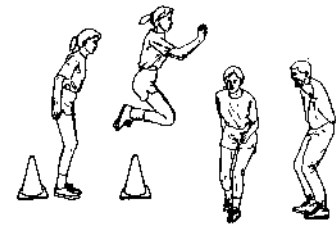
- 14** With the support of a cone as a reference, perform the Jumps laterally. Jump up, but pushing to the side and raising your knees to jump sideways over the cone.



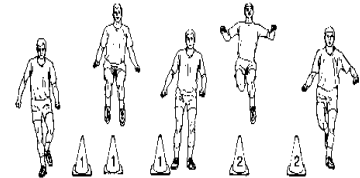
- 15** With the support of a cone as a jump reference, perform the jumps frontally. Keeping your feet apart from each other at a distance equal to shoulder width, jumping over each cone, and falling on both feet at the same time. the technical gesture includes swinging both arms and taking the time because as you train you must decrease it.



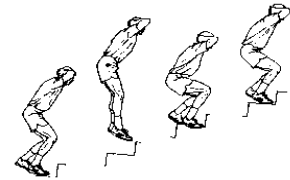
- 16 With the support of a cone as a jump reference perform the jumps on them consecutively to Sprint with change of direction. perform the jumps with both feet together on the row of cones; at the time of jumping the last cone, the partner or teacher must point to one of the two cones located far; advance towards the indicated performing Sprint immediately after falling from the last jump.



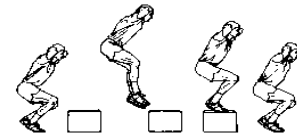
- 17 With the support of cones as a reference for jumps make side jumps along the line of cones and fall on both feet. When jumping the last cone, fall on the outer foot and push with it to change direction, then jumping with both feet on its side to the other side of the row of cones.



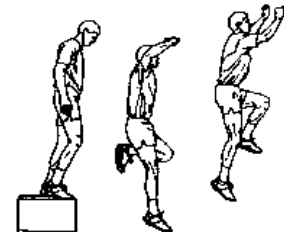
- 18 Perform jumps up steps. Skip the first step and continue upwards for 10 or more jumps.



- 19 Multi-hops on boxes with maximum leg flexion. Jump to climb to the first box, and fall gently with your legs bent. Keeping your legs bent, jump from the box to the other side and immediately go up and down from the following boxes. Keep your hands on your hips or behind your head.



- 20 Drop Jump to one leg. Jump out of the box and fall on one foot. Then jump as high as you can, falling on the same foot. Maintain contact with the ground for the shortest possible time. For greater difficulty, jump into a second box after the jump. This is a very advanced exercise that should not be executed by beginners.



Prepared by the authors on the basis of (Esper, 2000) and (Lorenzo & Luna, 2002)

Methodology

The present study consisted of an Explanatory level, quantitative, quasi-experimental research of retrospective longitudinal cut, due to the fact that evaluations were carried out on the target population in two periods within the 2019-2020 school year, an initial evaluation and a final one. Likewise, the students were applied exercises aimed at improving the ability to react at the exit of the 50meters flat speed test.

Among the methods used are the inductive deductive, synthesis analysis, scientific observation and the statistical method. The techniques used were data recording, observation, and the use of secondary information sources. Similarly, the instruments used were: annotation book and the observation sheet.

The population was constituted by the total of students of eighth year of basic general education (Arias, 2006) "The population, or in more precise terms target population, is a finite or infinite set of elements with common characteristics for which the conclusions of the research will be extensive. This is delimited by the problem and by the objectives of the study." (p. 81)

The sampling corresponds to a statistical sampling of a non-probabilistic type, since the population is constituted by a total of 112 students, we worked with 100% of the population:

Below is a table containing the numerical summary of the distribution of the samples:

Table 1. - Summary of research samples.

Order	Population	Quantity	Sample	Percentage
1	Eighth A Students	39	39	100,00%
2	Eighth B Students	37	37	100,00%
3	Eighth C Students	36	36	100,00%

Elaboration: The authors

The methods used were: The empirical method with which contribution is given to the research process fundamentally in what is mentioned by (Martínez & Rodríguez, 2015) since these methods make it possible to reveal the essential relationships and fundamental characteristics of the object of study, accessible to the detection sensorceptiva, through practical procedures with the object and various means of study.

Among the methods that were used in the research process are: Scientific Observation with its respective recording instrument, measurement referring to the tests or tests that were carried out; Theoretical Methods such as analysis, synthesis, induction and deduction were also used, undeniably the techniques of collection and review of primary and secondary information were used.

The test used to measure reaction capacity was the 50-meter smooth test used by Parco (2013) as a test to assess the basic physical qualities of Physical Education students.

For the application the student will dress as with appropriate shoes and will perform a total warm-up, then stands, behind the starting line and the signal made by the teacher, must leave and travel 50 meters as quickly as possible. The teacher will stop the stopwatch when the student passes the finish line; for its execution a flat terrain with a distance of more than 50 meters is required because there must be a passing and recovery area, the terrain must be demarcated with start and finish lines in the distance of 50 meters, a chronometer, annotation book a whistle. Two or three attempts will be made with full recovery between them and the best time will be recorded.



Illustration 2. - Minimum requirements for the execution of the test of the 50 meters smooth

For the assessment of the test of the 50 m smooth, the evaluation table proposed by Parco (2013) was used, in which a valuation scale ranging from 1 to 10 is proposed in relation to the best time spent in the execution of the test.

Table 2. - Time evaluation table for the 50-meter flat test

POINTS	QUANTITATIVE SCALE	12 MALE YEARS	12 YEARS WOMEN
10	EXCELLENT	7,3	7,9
9,5		7,45	8
9		7,6	8,1
8,5	VERY GOOD	7,75	8,25
8		7,9	8,4
7,5		8,5	8,55
7		8,2	8,7
6,5	WELL	8,35	8,85
6		8,5	9
5,5		8,65	9,15
5		8,8	9,3
4,5		8,95	9,45
4		9,1	9,6
3,5	REGULAR	9,25	9,75
3		9,4	9,9
2,5		9,55	10,05
2		9,7	10,2
1,5		9,85	10,35
1		10	10,5
0,5		10,15	10,65

Prepared by the authors on the basis of (Parco, 2013, Pp. 12-16) and the Instructions for the application of student evaluation of the (Ministry of Education of Ecuador, 2016, p. 8)

Results

Once the 50-meter test was applied initially and finally, the results were reflected in the following tables and graphs:

Table 3. -Test 50 meters flat applied to male students of the eighth year A of EGB

NRO	SURNAMES/FIRST NAMES	BEST INITIAL RESULT	BEST FINAL RESULT
1	AGUILAR ROSADO CRITHIAN ALEJANDRO	10,15	8,65
2	AVILA TAPIA LUIS MARIO	8,65	8,2
3	BAJAÑA QUIÑONES DANIEL EDUARDO	8,5	7,3
4	BAJAÑA ZAMBRANO JEREMY JHAIR	8,65	7,45
5	BARRETO MATA NEICER ARIEL	9,85	7,6
6	BRAVO TORRES RONAL GABRIEL	9,25	7,75
7	BRIONES MACAY STEVEN MIGUEL	9,4	7,9
8	BRIONES VERA LENNY ARIEL	8,75	8,5

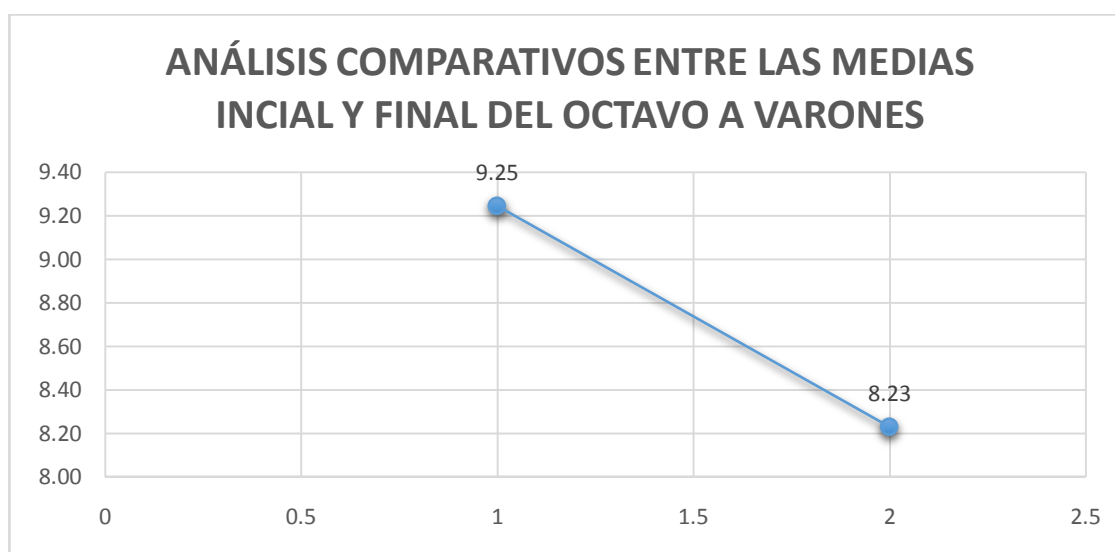
9	BURGOS QUIÑONES JACKSON JAVIER	9,85	8,2
10	FARFAN GARCIA GEORGE ANDREI	9,7	8,35
11	JACOME MACIAS ERIK GABRIEL	9,1	8,5
12	LAGE MAQUILON JEREMY LEONEL	8,95	8,65
13	MEDINA ZAMBRANO LEYTON GABRIEL	9,35	8,8
14	MEDINA ZAMBRANO LEYTON LEONARDO	9,75	8,5
15	MOSQUERA DIAZ LUIS DANIEL	8,7	9,1
16	NAZARENE POVEDA SERGIO DAVID	8,75	7,9
17	PACHECO QUIMIS JUAN DAVID	10	8,35
18	PALADINES LOZADA CARLOS GEOVANNY	8,95	7,75
19	PALMA VERA LUCAS MATHIAS	9,35	8,65
20	RODRIGUEZ CHICA BRUSH	9,25	8,5

Prepared by the authors

Table 4. - Descriptive statistics of table 3

	BEST INITIAL RESULT		BEST FINAL RESULT
Media	9,25	Media	8,23
Typical error	0,113259135	Typical error	0,108603577
Median	9,25	Median	8,35
Fashion	8,65	Fashion	8,5
Standard deviation	0,506510248	Standard deviation	0,48568996
Sample variance	0,256552632	Sample variance	0,235894737
Curtosis	-1,174007693	Curtosis	-0,68436752
Coefficient of asymmetry	0,247456693	Coefficient of asymmetry	-0,343981319
Rank	1,65	Rank	1,8
Minimal	8,5	Minimal	7,3
Maximum	10,15	Maximum	9,1
Sum	184,9	Sum	164,6
Account	20	Account	20

Prepared by the authors on the basis of data in Table 3



Prepared by: The authors

Source: Initial and Final Average, Table 3

Description and analysis:

The eighth year of basic general education parallel A of the Educational Unit "San Camilo" of the City of Quevedo province of Los Ríos was made up of 20 male students to whom the initial test was applied on Monday, June 10, 2019 while the final test was carried out on August 12, 2019, the initial and final results are detailed in table number 4 in which it is observed that:

The initial mean was 9.25 seconds this result placed the group of men in the evaluation range of 3.5 points obtained, the best time in the initial test was 8.5 seconds this time obtained the best grade that was 7.5 points while the worst time was 10.15 seconds to whom a grade of 0.5 points was assigned.

The final average was 8.23 seconds this result placed the group of men in the evaluation range of 7 points obtained, the best time in the final test was 7.3 seconds this time obtained the best grade that was 10 points while the worst time was 9.1 second to whom a grade of 4 points was assigned.

Other indicators of the descriptive statistics that were used in the initial evaluation correspond to the median which represents the values located in the middle of the data set this was 9.25 seconds which is equivalent to the score of the average 3.5 points; the fashion that represents the value that has more frequency within the set of initial data corresponds to 8.65 seconds therefore the initial score most often assigned to the students evaluated was 5.5 points.

Finally, a measure of dispersion trend was applied that corresponds to the difference between the largest and lowest value of the variable used was the standard deviation this measures the dispersion of a data distribution, therefore, the more dispersed a data distribution is, the larger its standard deviation, this was 0.506510248.

Similarly, the same indicators of the descriptive statistics were used in the final evaluation, this corresponds to the median which was 8.35 seconds, which is equivalent to the average score of 6.5 points; the fashion was 8.5 seconds therefore the final score most often assigned to the students evaluated was 6 points and the standard deviation this was 0.48568996, this evidences a reduction in the dispersion of the data and in the average time taken by the students to execute the test of 50 m smooth.

On the other hand, the comparative analysis of the averages both initial 9.25 seconds, as well as final 8.23 seconds shows an improvement of 1.015 seconds which proposes that the applied exercises have given results with this group of students by reducing the execution times of the race of the flat meters.

Table 5. - Test 50 meters flat applied to female students of the eighth year A of EGB

NR O	SURNAMES/FIRST NAMES	BEST INITIAL RESULT	BEST FINAL RESULT
1	ALMEA MORA CARMEN ELOYSA	9	8,25
2	ARGANDOÑA CEDEÑO DANNA ANABEL	9,3	8,55
3	BAQUE ZAMBRANO GISSEL AILY	9,6	8,87
4	BAZAN SOLORZANO YAMILE LUCIA	9,9	9
5	BRIONES MACAY MERLY NOHELIA	10,2	8,85
6	BURGOS LOOR ADELAIDE MAGDALENA	10,5	8,7
7	COLLANTES MONTERO LUCELY ANAHI	10,65	10,2
8	FORTS ALCIVAR TAHIS FERNANDA	10,35	10

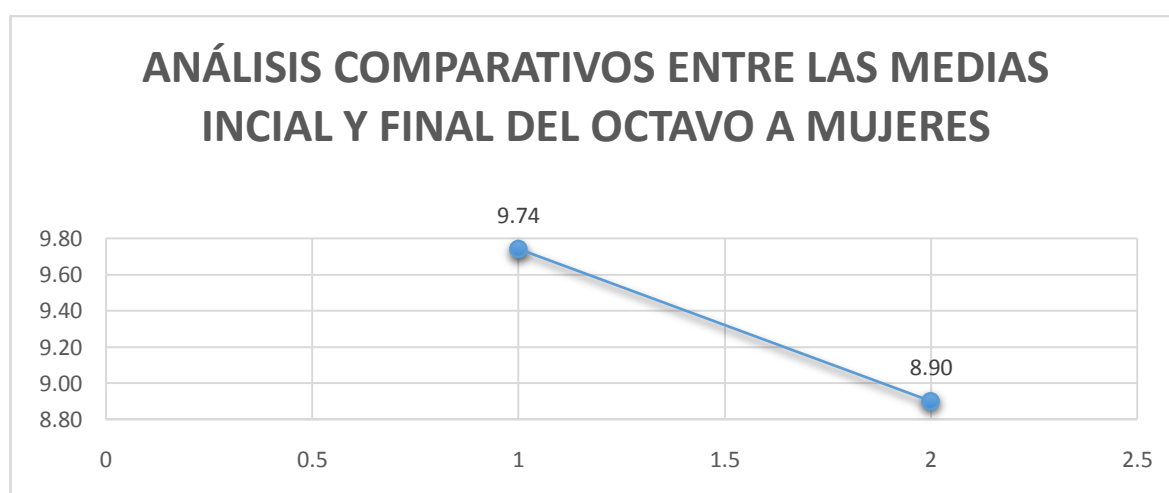
9	GARCIA TRIANA PIERINA ALISSON	10,05	9,45
10	MACIAS GOMEZ ARIANA THAIS	9,75	8
11	MUÑOS LOOR MELANIE ANDREINA	9,45	8,85
12	MUÑOZ VILLAMAR DENISSE JESENIA	9,15	8,1
13	NAZARENE LOAIZA NAOMY DARILEY	9,15	8,25
14	OLIVO BORJA VANESSA XIMENA	9,3	8,5
15	OTO SANTOS NADIA NALLERLY	9,45	8,75
16	PALACES MARTINEZ ANAHIS LILIBETH	9,6	9
17	PERALTA GANCHOSO VALESKA VALENTINA	9,75	9,05
18	RICAURTE VILLACRECES NOEMY MAGDALENA	9,9	8,85
19	RUIZ CEVALLOS CINTHYA SCARLETH	10,05	9,9

Prepared by the authors

Table 6. - Descriptive statistics of Table 5

BEST INITIAL RESULT		BEST FINAL RESULT	
MEDIA	9,74	MEDIA	8,90
TYPICAL ERROR	0,109107434	TYPICAL ERROR	0,141972106
MEDIAN	9,75	MEDIAN	8,85
FASHION	9,3	FASHION	8,85
STANDARD DEVIATION	0,475588278	STANDARD DEVIATION	0,618842061
SAMPLE VARIANCE	0,226184211	SAMPLE VARIANCE	0,382965497
CURTOSIS	-0,766870318	CURTOSIS	0,060063762
COEFFICIENT OF ASYMMETRY	0,299177235	COEFFICIENT OF ASYMMETRY	0,725484457
RANK	1,65	RANK	2,2
MINIMAL	9	MINIMAL	8
MAXIMUM	10,65	MAXIMUM	10,2
SUM	185,1	SUM	169,12
ACCOUNT	19	ACCOUNT	19

Prepared by the authors on the basis of data in Table 5



Prepared by: The authors

Source: Start and End Average, Table 5

Description and analysis

The students of the eighth parallel course A of the Educational Unit "San Camilo" was made up of 19 female students to whom the initial test was applied on June 11, 2019 while the final test was applied on August 12, 2021, the initial and final results are detailed in table number 6 in which it is observed that:

The initial mean was 9.74 seconds this result placed the group of women in the evaluation range of 4 points obtained which is equivalent within the evaluation scale to good, the best time in the initial test was 9 seconds therefore obtained the best grade that was 6 points while the worst time was 10.65 seconds to this student was assigned a grade of 0.5 points equivalent to regular.

The final average was 8.23 seconds this result placed the group of women in the evaluation range of 7 points obtained, the best time in the final test was 7.3 seconds this time obtained the best grade that was 10 points while the worst time was 9.1 second to whom a grade of 4 points was assigned.

The indicators of the descriptive statistics that were used in the initial evaluation correspond to the median which represents the values located in the middle of the data set this was 9.75 seconds which is equivalent to regular; the fashion that represents the value that has more frequency within the set of initial data corresponds to 9.3 seconds therefore the initial score most often assigned to the students evaluated was 5 points which places the group of women of this parallel in the evaluation scale of good.

Finally, a measure of dispersion trend was applied that corresponds to the difference between the largest and lowest value of the variable used, this was the standard deviation which measures the dispersion of a data distribution, therefore, the more dispersed a data distribution is, the larger its standard deviation, the value of this was 0.475588278

The same indicators of the descriptive statistics were used in the final evaluation, this corresponds to the median which was 8.85 seconds which is equivalent to the average score 6.5 points which is equal to good; the fashion was 8.85 seconds, therefore the final score most frequently assigned to the female students evaluated was 6.5 equivalent to good; the standard deviation this was 0.618842061 this evidences a growth in the dispersion of the data, which indicates that the improvement of the time was not uniform since the variance is greater than the initial one.

On the other hand, the comparative analysis of the averages both initial 9.74 seconds equivalent to 4 with valuation range of good step in the final stage to 8.90 seconds or equivalent to a score of 6.5 that is equal to very good, this evidences an improvement of 0.85 seconds which means that the applied exercises have given results.

Table 7. - Test 50 meters flat applied to male students of the eighth year B of EGB

NO	SURNAMES/FIRST NAMES	BEST INITIAL RESULT	BEST FINAL RESULT
1	ALVARADO MACIAS MARLON STIK	8,2	7,3
2	CAMINO GUANANGA ELKIN OMAR	8,35	7,45
3	CARRANZA ZAMBRANO STEVEN SNAIDER	8,5	7,6
4	CEDEÑO VERA DOMINICK CEMIL	8,65	7,75
5	CHALAR FAJARDO ANDERSON JOMAR	8,8	7,9
6	CHAVEZ VELEZ MATHEUS JOSE	8,95	8,5
7	CHICHANDE ULLOA JORGE LUIS	9,1	8,2
8	COELLO FRANCO ANGEL LEONARDO	9,25	8,35
9	LOPEZ MENDOZA ANTHONY ALFREDO	9,4	8,5

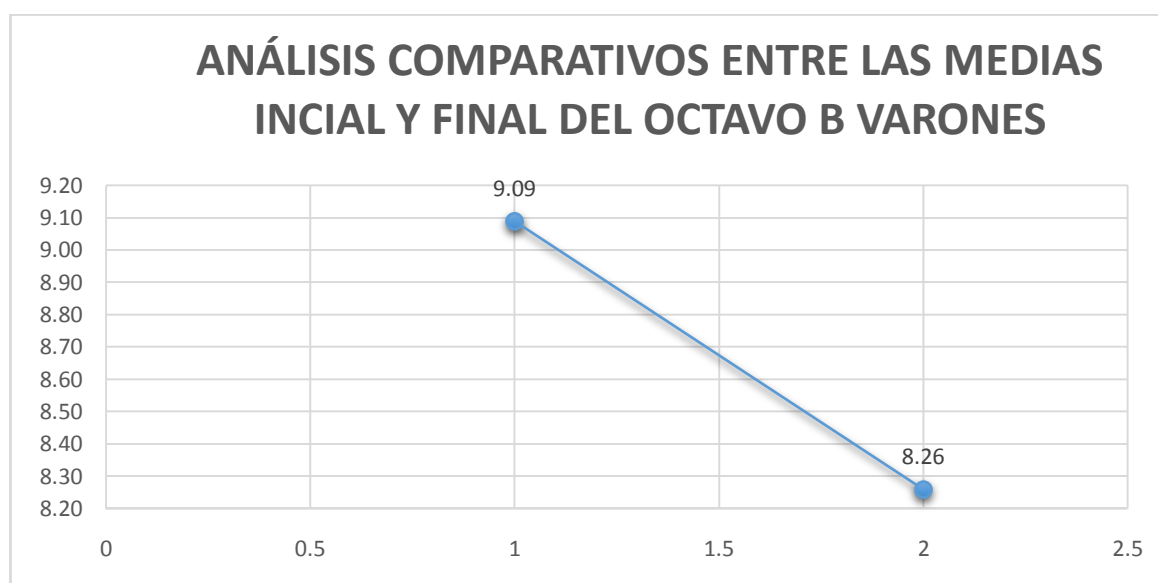
10	MEDINA PALACIN JASSON	9,55	8,65
11	MASABANDA QUIIJE LUIS FERNANDO	9,7	8,8
12	MIELES NAVARRETE FRANKLIN JEAMPIERE	9,85	8,95
13	MONTECE FREIRE BRUSH DANILO	10	9,1
14	MORAN TAPIA ANGEL ALFREDO	10,15	9,5
15	MOROCHO DIAZ JEREMY JAHIR	8,95	8
16	ZAMORA MONTERO RAFAEL SNAIDER	8	7,6

Prepared by the authors

Table 8. - Descriptive statistics of Table 7

BEST INITIAL RESULT		BEST FINAL RESULT	
MEDIA	9,09	MEDIA	8,26
TYPICAL ERROR	0,163649778	TYPICAL ERROR	0,160676872
MEDIAN	9,025	MEDIAN	8,275
FASHION	8,95	FASHION	7,6
STANDARD DEVIATION	0,654599114	STANDARD DEVIATION	0,642707489
SAMPLE VARIANCE	0,4285	SAMPLE VARIANCE	0,413072917
CURTOSIS	-1,006087557	CURTOSIS	-0,815945232
COEFFICIENT OF ASYMMETRY	0,017469072	COEFFICIENT OF ASYMMETRY	0,257238886
RANK	2,15	RANK	2,2
MINIMAL	8	MINIMAL	7,3
MAXIMUM	10,15	MAXIMUM	9,5
SUM	145,4	SUM	132,15
ACCOUNT	16	ACCOUNT	16

Prepared by the authors on the basis of data in Table 7



Prepared by: The authors

Source: Initial and Final Average, Table 8

Description and analysis

The eighth parallel course B of the Educational Unit "San Camilo" was made up of 20 male students to whom the initial test was applied on Wednesday, June 12, 2019, while the final

test was applied on August 14, 2021, the initial and final results are detailed in table number 8 in which it is observed that:

The initial mean was 9.09 seconds this result placed the group of men in the evaluation range of 4 points that is equal to good within the quantitative scale, the best time in the initial test was 8 seconds this time obtained the best grade that was 8 points and was located within the range of very good, on the other hand, the worst time was 10.15 seconds who was assigned a grade of 0.5 points and was placed in the regular range.

The final average was 8.26 seconds this result placed the group of men in the evaluation range of 7 points which allowed them to obtain an overall assessment of very good, the best time in the final test was 7.3 seconds this time obtained the best grade that was 10 points obtaining the quantitative rating of excellent, while the worst time was 9.1 seconds who was assigned a score of 4 points and placed within the range of good.

Other indicators of the descriptive statistics that were used in the initial evaluation correspond to the median which represents the values located in the middle of the data set this was 9.025 seconds which is equivalent to the score of the average 4 points which is within the range of good; the fashion that represents the value that has more frequency within the set of initial data corresponds to 8.95 seconds therefore the initial score most often assigned to the students evaluated was 4.5 points equivalent to good.

Finally, a measure of dispersion trend was applied that corresponds to the difference between the largest and lowest value of the variable used was the standard deviation this measures the dispersion of a data distribution, therefore, the more dispersed a data distribution is, the larger its standard deviation, this was 0.654599114.

Similarly, the same indicators of the descriptive statistics were used in the final evaluation, the median was 8.275 seconds which is equivalent to the average score of 7 points and equivalent to very good; the fashion was 7.6 seconds therefore the final score most often assigned to the students evaluated was 9 points and the standard deviation this was 0.642707489, this evidences a reduction in the dispersion of the data and in the average time taken by the students to run the test of 50 m smooth.

On the other hand, the comparative analysis of the averages both initial 9.09 seconds, as well as final 8.26 seconds shows an improvement of 0.83 seconds which indicates that the exercises applied have given results.

Table 9. - Test 50 meters flat applied to female students of the eighth year B of EGB

NO	SURNAMES/FIRST NAMES	BEST INITIAL RESULT	BEST FINAL RESULT
1	ALVARADO SUCRE ANGIE LIZBETH	9	8
2	ALVIA RODRIGUEZ EMILY ALEJANDRA	9,15	8,1
3	APRAEZ PINTO KENLLY MARGOTH	9,3	8,25
4	QUIJIJE FIELDS KARLA LISSETTE	9,45	8,4
5	CAMPUZANO TORRES MERLY ANAHI	9,6	9
6	CAMUENDO OTAVALO SARA JULISA	10	9,15
7	CANO PLUAS WHITE VALENTINA	9	9,3
8	CAÑOLA CHICHANDE MARIA FERNANDA	9,15	8
9	CARCAMO ANDRADE MELANY AILEN	9,3	8,1
10	CASTLE RODRIGUEZ NATHALY JUDITH	9,45	8,25
11	CASTRO RIZO ANTONELL MAYZA	9,6	8,4
12	CHINCHAY CHUEZ DILEID JASU	9,75	8,55

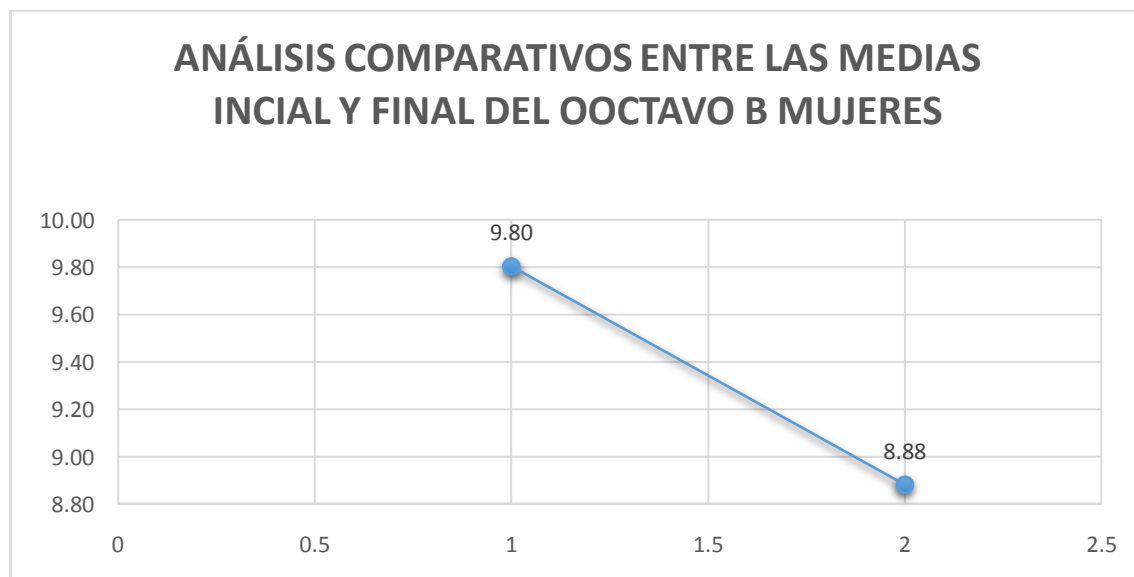
13	LOPEZ POWELL KEYLA	9,9	8,7
14	MACIAS PATIÑO ROCIO CAROLINA	10,05	8,85
15	MAYORGA BUSTS MAYLEEN ISABEL	10,2	9
16	MIÑO SPAIN BRITNEY STACY	10,35	9,45
17	MOREIRA ALAVA AYLEEN DAY ANNA	10,5	9,6
18	MOREIRA TUBAY MEDERLIN ELEIDY	10,65	9,75
19	RIZO MOREIRA PAOLA	10,35	9,75
20	ZAMBRANO SANGACHA ANA KARELYS	10,5	9,9
21	ZAMBRANO TANQUINO KERLYN YOLANDA	10,65	10,05

Prepared by the authors

Table 10. - Descriptive statistics of table 9

BEST INITIAL RESULT		BEST FINAL RESULT	
MEDIA	9,80	MEDIA	8,88
TYPICAL ERROR	0,122031649	TYPICAL ERROR	0,148056188
MEDIAN	9,75	MEDIAN	8,85
FASHION	9	FASHION	8
STANDARD DEVIATION	0,559219269	STANDARD DEVIATION	0,67847869
SAMPLE VARIANCE	0,31272619	SAMPLE VARIANCE	0,460333333
CURTOSIS	-1,39131511	CURTOSIS	-1,319994643
COEFFICIENT OF ASYMMETRY	0,101483098	COEFFICIENT OF ASYMMETRY	0,259802607
RANK	1,65	RANK	2,05
MINIMAL	9	MINIMAL	8
MAXIMUM	10,65	MAXIMUM	10,05
SUM	205,9	SUM	186,55
ACCOUNT	21	ACCOUNT	21

Prepared by the authors on the basis of data in Table 9



Prepared by: The authors

Source: Initial and Final Average, Table 9

Description and analysis:

There are a total of 21 female students of the eighth parallel course A of the Educational Unit "San Camilo" to whom the initial test was applied on June 13, 2019 while the final test

was applied on August 15, 2021, the initial and final results are detailed in table number 10 in which it is observed that:

The initial mean was 9.80 seconds this result placed the group of women in the evaluation range of 3.5 points obtained which is equivalent within the assessment scale to regular, the best time in the initial test was 9 seconds therefore obtained the best grade that was 6 points equivalent to good, while the worst time was 10.65 seconds this student was assigned a grade of 0.5 points equivalent too regular.

The final mean was 8.88 seconds this result placed the group of women in the evaluation range of 6 points which is equal to good within the valuation scale, the best time in the final test was 8 seconds this time obtained the best grade that was 9.5 points which is quantitatively valued within the range of excellent, while the worst time was 10.05 seconds who was assigned a grade of 2.5 points and was valued as regular.

The indicators of the descriptive statistics that were used in the initial evaluation correspond to the median which represents the values located in the middle of the data set this was 9.75 seconds which is equivalent to a grade of regular; the fashion that represents the value that has more frequency within the set of initial data corresponds to 9 seconds therefore the initial score most often assigned to the students evaluated was 5 points which places the group of women of this parallel in the evaluation scale of good.

Finally, a measure of dispersion trend was applied that corresponds to the difference between the largest and lowest value of the variable used, this was the standard deviation which measures the dispersion of a data distribution, therefore, the more dispersed a data distribution is, the larger its standard deviation, the value of this was 0.559219269.

The same indicators of the descriptive statistics were used in the final evaluation, the median was 8.85 seconds which is equivalent to the average score 6.5 points which is equal to good; the fashion was 8 seconds therefore the final score most often assigned to the female students evaluated was 9.5 points equivalent to excellent; the standard deviation this was 0.67847869 this evidences a growth in the dispersion of the data, which indicates that the improvement of the time was not the same for the whole group highlighting only some cases, since the variance is greater than the initial one.

In relation to the comparative analysis of the averages, the initial average was 9.80 seconds equivalent to 3.5 with a regular assessment range while after the application of the exercise program this result improved to 8.88 seconds which is equivalent to a score of 6 that is equal to good, this evidences an improvement of 0.92 seconds which evidences a favorable result for this group of students.

Table 11. - Test 50 meters flat applied to male students of the eighth year C of EGB

N	SURNAMES/FIRST NAMES	BEST INITIAL RESULT	BEST FINAL RESULT
1	ALCIVAR MENDOZA JORDAN YANDEL	8,5	7,3
2	ARAUJO PONCE JESUS SUNDAY	8,2	7,45
3	ESPINOZA ARIAS BRYAN STEVEN	8,35	7,6
4	ESPINOZA ROMERO JOSE ANTONIO	8,5	7,75
5	FREIRE PILLASAGUA KENNDY ALEXANDER	8,65	7,9
6	GONZALEZ ZAMBRANO JORDY ARIEL	8,8	8,5
7	HERNANDEZ LUNA LEYTHER EMILIO	8,95	8,2
8	PINARGOTE CERESO MANUEL ALFREDO	10	8,35
9	PORTILLA NARANJO ELKIN ADRIAN	9,85	8,5

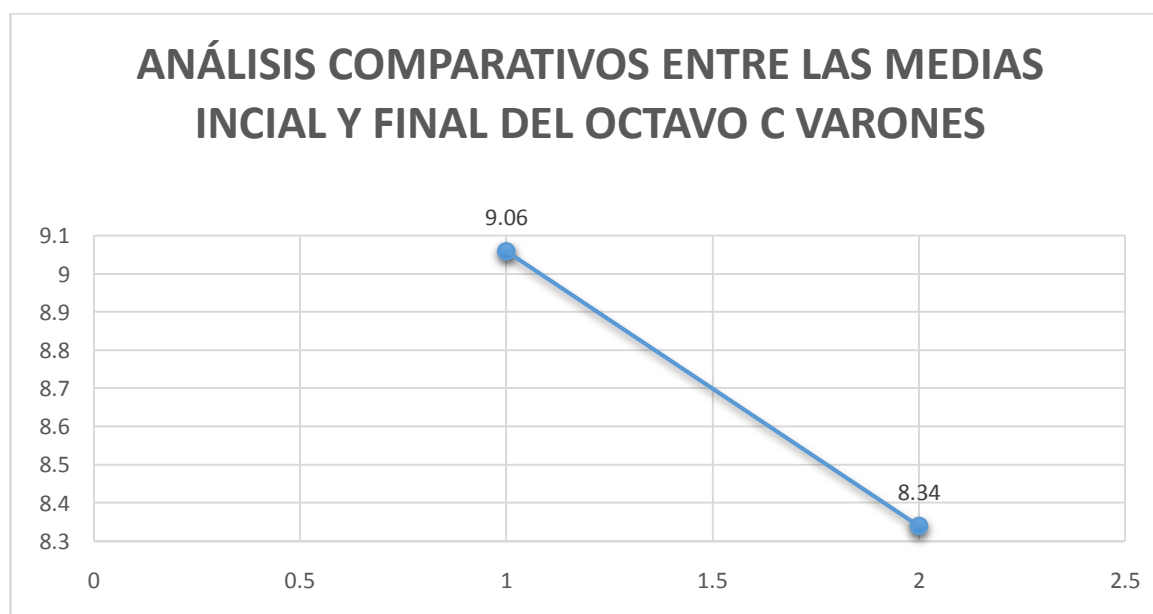
10	QUINTANA CASTRO JUBER JAVIER	9,7	8,65
11	RAMIREZ GOMEZ JORDY REINALDO	9,5	8,8
12	RENDON BARZOLA BRUNO JERAUDY	8	8,95
13	REYES RODRIGUEZ MARCOS EZEQUIEL	9,25	9,1
14	SIGCHO BONIFAZ JOSUE MATIAS	9,9	9
15	ZAPATA RUIZ VICENTE GEREMY	9,75	9,05

Prepared by the authors

Table 12. - Descriptive statistics of table 11

BEST INITIAL RESULT		BEST FINAL RESULT	
MEDIA	9,06	MEDIA	8,34
TYPICAL ERROR	0,176891142	TYPICAL ERROR	0,157827513
MEDIAN	8,95	MEDIAN	8,5
FASHION	8,5	FASHION	8,5
STANDARD DEVIATION	0,685096448	STANDARD DEVIATION	0,611263329
SAMPLE VARIANCE	0,469357143	SAMPLE VARIANCE	0,373642857
CURTOSIS	-1,577069456	CURTOSIS	-1,228814986
COEFFICIENT OF ASYMMETRY	-0,006412864	COEFFICIENT OF ASYMMETRY	-0,390331539
RANK	2	RANK	1,8
MINIMAL	8	MINIMAL	7,3
MAXIMUM	10	MAXIMUM	9,1
SUM	135,9	SUM	125,1
ACCOUNT	15	ACCOUNT	15

Prepared by the authors on the basis of data in Table 11



Prepared by: The authors

Source: Initial and Final Average, Table 11

Description and Analysis

The eighth parallel course C of the Educational Unit "San Camilo" was made up of 15 male students to whom the initial test was applied on Monday, June 17, 2019, while the final test was applied on August 19, 2021, the initial and final results are detailed in table number 12 in which it is observed that:

The initial mean was 9.06 seconds this result placed the group of men in the evaluation range of 4 points that is equal to good within the quantitative scale, the best time in the initial test was 8 seconds this time obtained the best grade that was 8 points and was within the range of very good, on the other hand, the worst time was 10 seconds who was assigned a 1-point grade and placed in the regular range.

The final average was 8.34 seconds this result placed the group of men in the evaluation range of 7 points which allowed them to obtain an overall assessment of very good, the best time in the final test was 7.3 seconds this time obtained the best grade that was 10 points obtaining the quantitative rating of excellent, while the worst time was 9.1 seconds who was assigned a score of 4 points and placed within the range of good.

Other indicators of the descriptive statistics that were used in the initial evaluation correspond to the median which represents the values located in the middle of the data set this was 8.95 seconds which is equivalent to the score of the average 4.5 points which is within the range of good; the fashion that represents the value that has more frequency within the set of initial data corresponds to 8.5 seconds therefore the initial score most often assigned to the students evaluated was 6 points equivalent to good.

Finally, a measure of dispersion trend was applied that corresponds to the difference between the largest and lowest value of the variable used was the standard deviation this measures the dispersion of a data distribution, therefore, the more dispersed a data distribution is, the larger its standard deviation, this was 0.685096448.

The same indicators of the descriptive statistics in the final evaluation are described below: The median was 8.5 seconds which is equivalent to the average score of 6 points and equivalent to good; the fashion was 8.5 seconds therefore the final score most frequently assigned to the students evaluated was 6 points and the standard deviation this was 0.611263329, this evidences a reduction in the dispersion of the data.

On the other hand, the comparative analysis of the averages both initial 9.06 seconds, as well as in the final evaluation which was 8.34 seconds, this shows an improvement of 0.72 seconds.

Table 13. - Test 50 meters flat applied to female students of the eighth year C of EGB

NO	SURNAMES/FIRST NAMES	BEST INITIAL RESULT	BEST FINAL RESULT
1	COBEÑA AVILA JANIELY CAMILA	9,15	8
2	DEMERA GAMBOA CARLA RASHELL	9,45	8,1
3	ESCOBAR CABALLERO EMILY DAYLIN	9,75	8,25
4	ESPINOZA ROMERO SHEYLY SCARLET	10,05	8,4
5	FIALLOS CASTAÑO LEIDY SOFIA	10,35	8,55
6	GONZALEZ RIZZO GENNESIS KATIUSKA	10,65	8,7
7	WAR DELGADO DAYANA ARLETT	9	8,85
8	HERRERA MERO ASHLEY GRAZZIANA	9,3	8,55
9	HIDALGO CARRIEL NOELIA MICHELL	9,6	8
10	LEON ALAVA CRISTINA FERNANDA	9,9	8,25
11	PALACIO COELLO MICHEL ANGIE	10,2	8,55
12	PEÑAFIEL ZAMBRANO MEISSY DANIELA	10,5	8,85
13	PUMA LUNA HOLLAND MAYSSA	10,65	8,1
14	RENDON VARGAS SCARLETT ASHLEY	10,45	8,25
15	RIVERA FLORES JULEXY JOSENKA	10,6	8,4

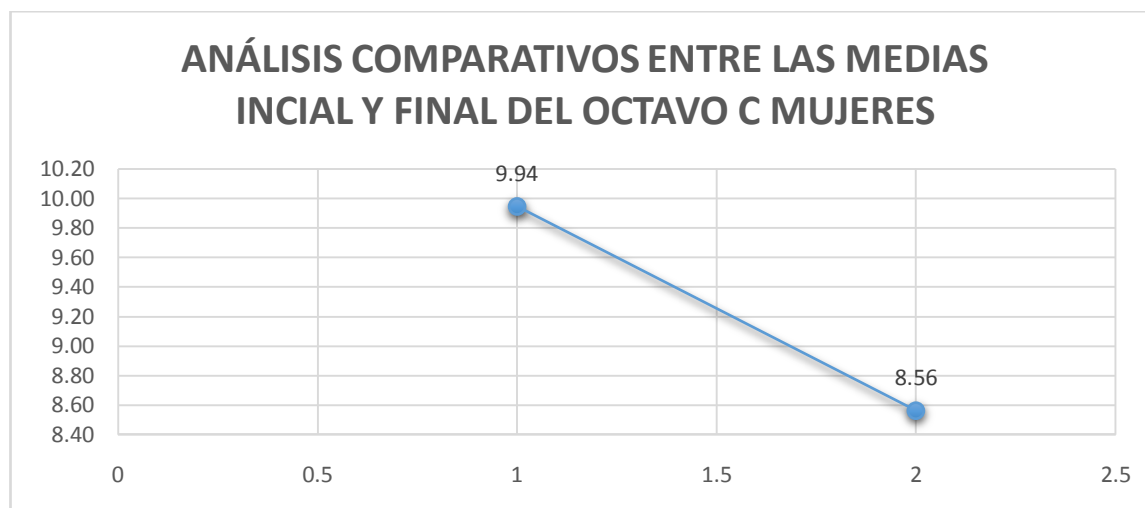
16	RODRIGUEZ ECHEVERRIA DILEYDI XIOMARA	9,45	8,55
17	SOLEDISPA BURGOS ANGELA MARINA	9,6	8,7
18	VELEZ SANCHEZ GABRIELA ALEJANDRA	9,75	8,85
19	FAITH MUST LADY MILENA	9,9	9
20	ZAMBRANO DIGUA OFELIA CRISTINA	10,3	9,5
21	ZAMBRANO GALARZA CORAIMA ANAHI	10,2	9,4

Prepared by the authors

Table 14. - Descriptive statistics of table 13

BEST INITIAL RESULT		BEST FINAL RESULT	
MEDIA	9,94	MEDIA	8,56
TYPICAL ERROR	0,110909965	TYPICAL ERROR	0,090823269
MEDIAN	9,9	MEDIAN	8,55
FASHION	9,45	FASHION	8,55
STANDARD DEVIATION	0,508253311	STANDARD DEVIATION	0,416204506
SAMPLE VARIANCE	0,258321429	SAMPLE VARIANCE	0,17322619
CURTOSIS	-1,073053346	CURTOSIS	0,1967471
COEFFICIENT OF ASYMMETRY	-0,207998892	COEFFICIENT OF ASYMMETRY	0,708141295
RANK	1,65	RANK	1,5
MINIMAL	9	MINIMAL	8
MAXIMUM	10,65	MAXIMUM	9,5
SUM	208,8	SUM	179,8
ACCOUNT	21	ACCOUNT	21

Prepared by the authors on the basis of data in Table 13



Prepared by: The authors

Source: Initial and Final Average, Table 14

Description and analysis

The 21 female students of the eighth parallel course C of the Educational Unit "San Camilo" to which the initial test was applied on Tuesday, June 18, 2019 and the final test was applied on August 20, 2021, obtaining the initial and final results that are detailed in table number 14 in which it is observed that:

The initial mean was 9.94 seconds this result placed the group of women in the evaluation range of 3 points obtained which is equivalent within the assessment scale to regular, the best time in the initial test was 9 seconds therefore obtained the best grade that was 6 points equivalent to good, while the worst time was 10.65 seconds this student was assigned a grade of 0.5 points equivalent to regular.

The final mean was 8.56 seconds this result placed the group of women in the evaluation range of 7.5 points which is equal to very good within the valuation scale, the best time in the final test was 8 seconds this time obtained the best grade that was 9.5 points which is quantitatively valued within the range of excellent, while the worst time was 9.50 seconds who was assigned a score of 4.5 points and was valued as good.

The other indicators of the descriptive statistics that were used in the initial evaluation correspond to the median which represents the values located in the middle of the data set this was 9.90 seconds which is equal to 3 points and is equivalent to a grade of regular; the fashion that represents the value that has more frequency within the set of initial data corresponds to 9.45 seconds therefore the initial score most often assigned to the students evaluated was 4.5 points which places this group of female students on the evaluation scale of good.

Finally, a measure of dispersion trend was applied that corresponds to the difference between the largest and lowest value of the variable used, this was the standard deviation which measures the dispersion of a data distribution, therefore, the more dispersed a data distribution is, the larger its standard deviation, the value of this was 0.508253311.

The same indicators of the descriptive statistics were used in the final evaluation, the median was 8.55 seconds which is equivalent to the average score 7.5 points which is equal to very good; the fashion was 8.55 seconds therefore the final score most often assigned to the female students evaluated was 7.5 points equivalent to very good, the standard deviation this was 0.416204506 this evidences a decrease in the dispersion of the data, which indicates that the improvement of the time was uniform for the whole group, because the variance is less than the initial one.

Regarding the comparative analysis of the averages, the initial average was 9.94 seconds equivalent to 3 with a regular valuation range while after the application of the exercise program this result improved to 8.56 seconds which is equivalent to a score of 7.5 that is equal to very good, this shows an improvement of 1.40 seconds which shows a very favorable result for this group of students.

Discussion

According to Cardona (2018) who quoted Verkhoshansky (2001) the ability to react refers to the ability acquired by an individual to respond in the shortest possible time to a stimulus of an auditory, visual or tactile nature that occurs in the environment, this simple when responding to a signal known or indicated above and the response can be given quickly with equally known or simple motor actions, as is the case of outings in athletics races is complex when there is a need to respond to a generally unknown stimulus.(p. 11)

For Robles (2014) there is a difference in the ability to react between untrained and trained people, this difference being significant in favor of trained subjects.

The practice of some sports disciplines or the execution of physical exercises allow to improve physical abilities, however to identify, select and program the appropriate motor responses it is necessary to identify the group of exercises that allow the development of stimuli of responses that are required to meet the objective therefore the systematic practice

of plyometric exercises has shown to have a very important role in improving simple reaction time, which is a necessary perceptual capacity in the activities of daily living.

This is consistent with what was mentioned by Reina (2020) the Plyometric Exercise allows the increase of the levels of Explosive Force, which serve to potentiate the realization of the various sports gestures, which in turn significantly improves the skills such as changes of direction, explosive movements, braking and acceleration are inherent qualities of hundreds of sports disciplines.

Therefore, it is extremely vital to develop this ability to improve the volitional level of students in the sporting aspect. This can be possible through the systematic practice of specific exercises.

This gives the guideline to apply the exercise program because they maximize the explosive response capacity of the students or athletes to whom they are applied, this has a direct impact on the improvement of the ability to react.

In reference to this Simbaña (2018) mentioned that "Plyometric training uses strength so quickly and energetically, because of that it is an ideal training to develop explosiveness and improves speed, [in women] it is recommended to work only with body weight to develop fast strength.

Therefore, when applying the exercise program, the physics capabilities such as the speed which includes the reaction speed improves significantly. According to Morales-Andrade (2021) The exercise program that integrates plyometric sessions allows to strengthen different aspects of the student, including strength in the lower train, acceleration, balance, speed and with this improve muscle power.

This shows that the use of plyometric exercises proposed in the research serves to improve physical abilities in their different manifestations.

Likewise, it is agreed with Haro and Cerón (2019) who indicated that plyometric exercises help in the short term because through this physical abilities such as speed and specific strength are improved in the female sex of fast and significant tide.

Based on this, it can be inferred that the exercise program is effective because in a short time it managed to significantly improve the times in the tests of the 50 meters smooth test which means that aspects have been improved including the reaction speed.

To this is added, what is mentioned by Prieto-barriga (2021) who indicated that the plyometric exercise is one of the most available and efficient training methods over time, provides a greater transfer in training which makes it suitable for application at all levels.

The author above, plus the evidence demonstrated through the tables and graphs serve as evidence that plyometric exercises help stimulate fast-twitch muscle fibers allowing to generate force quickly and efficiently, due to the cycle of stretching-muscle shortening according to the exercises proposed in the program since by storing and releasing elastic energy increases the speed in its different manifestations especially the reaction.

Finally, Terán (2019) indicated that the training program with plyometric exercises helps to improve physical abilities such as power and speed. Also, today it is known that not only the improvement of physical abilities but also influence the competitiveness of people who perform this type of exercise.

Therefore, the exercise program proposed in this research bases the achievement of objectives of improving the ability to react and other physical abilities involved in training or in the execution of the exercises in a systematic and programmed manner.

Conclusions

The general objective of the research was met because a total of 20 plyometric exercises were selected that are part of the exercise program proposed in the research, with the application of this program the question of the research was answered, therefore the following conclusions were reached.

The application of the initial test was carried out during the days 10, 11, 12, 13, 17 and 18 of June of 2019 while the execution of the final test was developed on days 12, 13, 14, 15, 19 and 20 of August of 2019, therefore, 37 sessions equivalent to 1480 minutes were carried out considering that the class hours are 40 minutes, in which the plyometric activities proposed in the exercise program were developed.

The improvement of physical abilities such as speed and especially in the ability to react is evident because there was a reduction in times according to the quantitative scale of measurement which was as follows: In the group of men of the eighth A of EGB to have a grade of regular went to very good; in the group of women of the same course of having a general rating from good they went to very good; in the eighth B the male students initially had an average on the valuation scale of good at the end they went to very good; the women of this regular course went on to good; finally the students of the parallel C of having an evaluation of good went to very good and the women in the same way went from good to very good.

With the records of the times in the execution of the test both initial and final it is evident that the reaction capacity improved therefore the program of exercises elaborated on the basis of the plyometric exercises directly affect the improvement of the capacity of reaction in the students of eighth year of higher basic education of the educational unit San Camilo.

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